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FUTURE DEMANDS ON THE PUBLIC LANDS. VOLUME I: POLICY IMPACTS OF FUTURE DEMANDS

Elmer F. Bennett, etal

Public Land Law Review Commission
Washington, D. C.

October 1970

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U. S. Public Land Law
Review Commission.
Future demands on the
public lands.

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FUTURE DEMANDS ON THE PUBLIC LANDS

Volume I

Policy Impacts of Future Demands

A Study Prepared by the Staff of the
Public Land Law Review Commission
Milton A. Pearl, Director

Project Officers:
Elmer F. Bennett
Eugene E. Hughes

Assisted by:
Leland O. Graham

Republished with Revisions
October 1970

The opinions, findings, conclusions and data expressed in this publication are those of the authors and not necessarily those of the Public Land Law Review Commission.

This publication constitutes only one of a number of sources of information utilized by the Commission in the conduct of its public land study program.

The Public Land Law Review Commission
FUTURE DEMANDS ON THE PUBLIC LANDS. Volume I:
Policy Impacts of Future Demands
by Commission Staff
Republished with revisions October 1970

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STANDARD TITLE PAGE FOR TECHNICAL REPORTS

1. Report No. PLLRC-21-1

2. Govt. Accession No.

3. Recipient's Catalog No.

4. Title and Subtitle
FUTURE DEMANDS ON THE PUBLIC LANDS. Volume II
Policy Impacts of Future Demands

5. Report Date Oct. 1970

6. Performing Organization Code

7. Author(s) Commission Staff

8. Performing Organization Rept. No. 21

9. Performing Organization Name and Address
The Public Land Law Review Commission
1730 K St., N. W.
Wash., D. C. 20006

10. Project/Task/Work Unit No.

11. Contract/Grant No. in house

12. Sponsoring Agency Name and Address
same as 9.

13. Type of Report & Period Covered interim

14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstracts

~~This~~ The report provides a concise statement of the broad implication of the projections of consumption and demand for policies concerning the supplying of various commodities from the public lands. It deals with the conceptual problems of making and using projections of demand, relevance of projected demand to public land policy, economic considerations affecting policies for supplying commodities from the public lands, and projected trends in resource use and their implication for supplying these commodities.

17. Key Words and Document Analysis. 17a. Descriptors

public lands, demands on

17b. Identifiers/Open-Ended Terms

17c. COSATI Field/Group [illegible]

18. Distribution Statement
available from Nat'l Technical Information Center at $3.00 paper, $0.65 microfiche

19. Security Class (This Report) UNCLASSIFIED

20. Security Class (This Page UNCLASSIFIED

21. No. of Pages 69

22. Price $3.00

FORM CFSTI-35

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note: This volume is the first in a four-part study of Future Demands on the Public Lands, prepared by the Commission staff with the assistance of four contractors and two consultants. The other three parts, published in three separate volumes, are subtitled as follows: Vol. II, Projections of the Consumption of Commodities Producible on the Public Lands of the United States 1980-2000; Vol. III, Probable Future Demands on Public Lands; and Vol. IV, Probable Future Demands on the Public Lands for New Cities and Urban Expansion.

FOREWORD

This manuscript is one of a series which was prepared for the Public Land Law Review Commission as part of its data base in forming the recommendations for future public land policies that have been forwarded to Congress and the President of the United States in our report titled One Third of the Nation's Land.[1]

In establishing the Public Land Law Review Commission in September 1964, Congress declared the following policy: That the public lands of the United States shall be (a) retained and managed or (b) disposed of, all in a manner to provide the maximum benefit for the general public. It also directed that a comprehensive review be made of the public land laws and the related administrative rules and regulations to determine whether and to what extent revisions are necessary to accomplish the stated policy objective.

Considerable evidence pointed to the need for such a review. Dating back in some cases to the birth of the nation, our public land laws have developed over a long period of years through a series of Acts of Congress which are not fully correlated with each other. Administration of the public lands and the related laws has been divided among several agencies of the Federal Government. Quite possibly, these laws and the manner in which they are administered may be inconsistent with one another and inadequate to meet the current and future needs of the American people.

The Commission was instructed to:

1. Study existing statutes and regulations governing the retention, management, and disposition of the public lands;
2. Review the policies and practices of the Federal agencies charged with administrative jurisdiction over such lands insofar as such policies and practices relate to the retention, management, and disposition of those lands;

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[1] Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. - Price $4.50.

3. Compile data necessary to understand and determine the various demands on the public lands which now exist within the foreseeable future; and

4. Recommend such modifications in existing laws, regulations, policies and practices as will, in the judgment of the Commission, best serve to carry out the policy objective.

To fulfill these requirements, the staff was charged with the responsibility of performing or having performed the appropriate research and of then presenting to the Commission all the information and data necessary as a foundation for the Commission's deliberations, conclusions and recommendations. A study program encompassing various subject areas was undertaken and separate manuscripts were prepared covering each of 33 separate topics.

In fulfillment of a policy of maintaining the smallest technical and professional staff possible, most of the studies were accomplished under contract with individuals, institutions such as universities, and research organizations; a few of the studies and analyses were accomplished in-house by the Commission staff, some with consultant assistance.

Thus, while we reviewed the whole body of public land laws at one time, each study was designed to examine only a portion of the public lands complex and should be utilized with this understanding. There is, therefore, an interrelationship among the studies and the resultant manuscripts that will require review and examination of more than one report in order to obtain a complete view of any one aspect of public land law and administration.

Each manuscript was transmitted from the staff with a letter discussing the content of the report and setting forth the policy matters to be considered with respect to the particular subject. A copy of the letter of transmittal for this report has been made a part of this volume in order to assist in the understanding of the approach.

These manuscripts served an extremely useful purpose in providing a common base for discussion in the Commission and between the Commission and its Advisory Council and the representatives of the 50 governors. We believe that they will also be valuable as reference works, not only on Federal public land matters but concerning all of our natural resources, for use by all levels of government -- Federal, state, and local -- and the academic community as well as those who are interested in the tremendous natural resources that we, as a nation, possess.

Wayne N. Aspinall

Wayne N. Aspinall
Chairman

Public Land Law Review Commission
1730 K Street, N.W.
Washington, D. C. 20006

October 5, 1970

Honorable Wayne N. Aspinall
Chairman
Public Land Law Review Commission
Washington, D.C.

Dear Mr. Chairman:

Transmitted herewith is a study of Future Demands on the Public Lands, prepared by the Commission staff and five contractors and consultants.

The particular areas treated in depth include projected demands on the public lands for commodity production over the next 30 years, potential use of public lands for urban expansion and the creation of new cities, and the impacts on policy which these future demands are likely to generate.

The study was designed to fulfill the requirement of the Commission's Organic Act of September 19, 1964, that the Commission "compile data necessary to understand and determine the various demands on the public lands which now exist and which are likely to exist within the foreseeable future."

The study consists of four major parts:

1. Policy Impacts on Future Demands, a staff analysis with consultant assistance, originally submitted to you January 14, 1970. This report provides a concise statement of the broad implication of the projections of consumption and demand for policies concerning the supplying of various commodities from the public lands. It deals with the conceptual problems of making and using projections of demand, relevance of projected demand to public land policy, economic considerations affecting policies for supplying commodities from the public lands, and projected trends in resource use and their implication for supplying these commodities. Based upon results of other parts of the overall demands study, this analytical report has a separate discussion of each major commodity, with the exception of Use and Occupancy, which is discussed in the last part of the overall study.

2. Projections of the Consumption of Commodities Producible on the Public Lands of the United States, 1980-2000, by Robert R. Nathan Associates, Washington, D.C., originally circulated to members of the Commission, the Advisory Council, and Governors' Representatives June 6, 1968, and formally transmitted to you November 12, 1969. This report contains projections for the years indicated of the likely future national and, in some cases, regional demands that can be expected for commodities producible on the public lands whether or not actually produced on them now or in the future.

3. Probable Future Demands on Public Lands, by Robert S. Manthy, East Lansing, Michigan, originally transmitted to you November 12, 1969. This report complements the Nathan study by translating its overall projections of national and regional demands into projections of demands likely to be placed on the public lands to produce the needed commodities.

4. Probable Future Demands on the Public Lands for New Cities and Urban Expansion, submitted originally to you February 6, 1970, consists of two sections. The first contains an introduction by the staff; letters from Governors' Representatives and a survey made by the Idaho Commission on Federal Land Laws, a report on actions taken to implement recent laws designed to make public lands available for urban or residential uses in Nevada; and a contract report on the use of public lands for urban purposes. The consultant who assisted in preparing the report on the use of laws for urban expansion was Raymond Smith, Reno, Nevada.

This portion of the report concerns the Public Land Sale Act of 1964 and several laws passed prior to that Act dealing with specific areas in Nevada. Urban America, Inc., Washington, D.C., was the contractor for the report, New Cities and the Public Lands, which makes up the final part of this section.

The second section contains a paper on New Towns and Federal Land, prepared for the Commission by Marion Clawson of Resources for the Future, Inc., Washington, D.C., and a report, New Cities and the Public Lands: Towards a New Urban Frontier within the Context of a National Urban Development Policy, prepared under contract by Daniel W. Cook, San Ramon, California.

Six points provided the framework for the contract reports by Urban America and Mr. Cook. The Department of Housing and Urban Development, the Idaho Commission on Federal Land Laws, and the Nevada State Committee on Federal Land Laws were also invited to provide their views as to the six points, with the understanding that the state groups need not concern themselves with the first point. The six points are:

a. The status of plans and recommendations for the development of a Federal policy to support or encourage the development of new urban areas, from which the Commission could develop an assumption as to the rationale of such Federal policy, particularly in the western public land states.

b. Without regard to a specific Federal policy to encourage the development of new urban areas, what are the locational forces, if any, that would tend to bring about such developments in the western public land regions?

c. The factors that influence whether urban expansion will most likely occur as additions to existing urban areas or as wholly new urban areas in public land states; how those factors are now developing.

d. Factors that influence the requirements for the development of viable new urban areas in regions where they do not now exist, with particular emphasis on the characteristics of possible viable new urban areas in the public land regions.

e. The role public lands might play in the development of new urban areas in public land regions, including the various conditions such as area, phasing of land availability or price, under which public lands might be made available if they are to contribute to the development of new urban areas and the alternative probable impacts through use of different conditions.

f. Factors to be taken into consideration by the Commission in formulating recommendations for statutory or regulatory criteria providing for the use of public lands in the development of new urban areas in public land regions.

In addition to the above request to the states of Idaho and Nevada, the Governors' Representatives of the western public land states, including Alaska, were asked to advise us of their views concerning the possible use of public lands in their states for the expansion of existing communities or as sites for the creation of new towns.

After you made copies available to the members of the Commission, the Advisory Council, and Governors' Representatives, the manuscripts were reviewed and comments were received from them.1/ The contractors were then furnished

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1/ Comments referred to are part of the official files of the Commission. When the Commission ceases to exist, these files will be deposited with the National Archives, Washington, D.C.

with all the comments for their consideration so that inaccuracies could be corrected. However, since the reports were theirs and not those of our commentators, we did not request the contractors to make any changes based on interpretations or opinions unless they agreed with those interpretations or opinions.

Policy considerations emerging from this study were as follows:

1. If there is indicated demand for a commodity that has traditionally been produced on the public lands, should efforts be made to continue production from the public lands to meet projected demand in the same proportion as in the past?
2. To what extent should projection of future demands such as those contained in this study be used in determining priorities for allocation of public lands to various uses?
3. What should the relative role be of the Federal public lands, vis-a-vis non-Federal lands, in meeting future needs for the various commodities producible on these public lands?
4. Should large units of public lands be allocated to the development of totally new cities and towns in public land areas?
    a. Can standards or guidelines be established at this time or should congressional approval be required on a case-by-case basis until there is a general Federal policy relating to new cities, and some experience is gained in the use of public lands for this purpose?
5. Under what conditions should public lands be made available for the expansion of existing communities?

The project officer for the Nathan, Manthy, and staff sections of the study was Thomas R. Waggoner. The New Cities and Urban Expansion section was conducted under the supervision of Perry R. Hagenstein.

Sincerely,

Milton Pearl

Milton A. Pearl
Director

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sted above is the professional staff as constituted in August 59 when the initial manuscripts were being readied for publi- tion by the Clearinghouse for Federal Scientific and Technical formation, together with the sub-professional and stenographic l clerical personnel on the staff at the time of publication of is report.

rry L. Moffett served as Assistant Director (Administration) om October 1966 to July 1969, and Leland O. Graham, Arthur D. ith and Max M. Tharp made significant contributions as members the staff prior to August 1969.

ADVISORY COUNCIL

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The following are presently members of the Advisory Council by virtue of their appointment under the provision of the Commission's organic act providing that:

> "The Chairman of the Commission shall request the head of each Federal department or independent agency which has an interest in or responsibility with respect to the retention, management, or disposition of the public lands to appoint, and the head of such department or agency shall appoint, a liaison officer who shall work closely with the Commission and its staff in matters pertaining to this Act."

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> "There is hereby established an Advisory Council, which shall consist of the liaison officers appointed under Section 5 of this Act, together with 25 additional members appointed by the Commission who shall be representative of the various major citizen's groups interested in problems relating to the retention, management, and disposition of the public lands,..."

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The Commission's Organic Act states that "The Chairman of the Commission shall invite the Governor of each State to designate a representative to work closely with the Commission and its staff and with the Advisory Council in matters pertaining to this Act". The following are serving as representatives of the Governors of the respective States at this time:

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PUBLIC LAND LAW REVIEW COMMISSION

Background

The public lands of America date back to the time of the Union's formation. Then, and soon thereafter, seven of the original States ceded to the Central Government some 233.4 million acres of land lying westward to the Mississippi River. Thereafter, through purchase and treaty, the United States acquired an additional billion acres of public domain, the last acquisition being the purchase of Alaska from Russia in 1867. Altogether, nearly 2 billion acres of land in 32 States have been part of the public domain at one time or another.

At first, these lands were sold for their revenue. Eventually, however, as the pioneers swept westward, the revenue-raising policy was replaced by one stressing settlement and development of the land. The Homestead Act of 1862 was the first of a series of settlement and development laws enacted over a period of some 60 years - the desert land law, mining laws, and the various homestead laws - all designed to meet a particular need of the period. Meanwhile, many millions of acres were transferred to private ownership through military, railroad, and other land grants, including various grants to the States.

Through these means, nearly 1.2 billion acres have passed from Federal ownership, leaving approximately 715 million acres of the original public domain lands in Federal ownership. Of these 715 million acres 364 million are in the State of Alaska. Add to this the 52 million acres acquired for various purposes, and federally owned lands today amount to approximately 770 million acres - about one-third of the Nation's total land area. Some of these lands are in national forests and some are reserved for national parks, wildlife refuges, and other specific uses; but more than half constitute the "vacant and unappropriated" public domain lands which have never left Federal ownership and have not been dedicated to a specific use pursuant to legislative authorization.

The Act establishing the Public Land Law Review Commission contains in section 10 the following definition:

> As used in this Act, the term 'public lands' includes (a) the public domain of the United States, (b) reservations, other than Indian reservations, created from the public domain, (c) lands permanently or temporarily withdrawn, reserved or withheld from private appropriation and disposal under the public land laws, including the mining laws, (d) outstanding interests of the United States in lands patented, conveyed in fee or otherwise, under the public land laws, (e) national forests, (f) wildlife refuges and ranges, and (g) the surface and subsurface resources of all such lands, including the disposition or restriction on disposition of the mineral resources in lands defined by appropriate statute, treaty, or judicial determination as being under the control of the United States in the Outer Continental Shelf.

Working with the Commission are a 33-member Advisory Council and the representatives of the 50 State Governors.

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POLICY IMPLICATIONS OF PROJECTIONS OF FUTURE DEMAND AND CONSUMPTION OF COMMODITIES PRODUCIBLE ON THE PUBLIC LANDS

Introduction

The Public Land Law Review Commission was established by Congress in 1964 with statutory responsibility to undertake a comprehensive review of the laws, rules, regulations, practices and procedures relating to the public lands of the United States. The Commission was directed to: (1) "study existing statutes and regulations governing the retention, management, and disposition of the public lands," (2) "review the policies and practices of the Federal agencies charged with administrative jurisdiction over such lands insofar as such policies and practices relate to the retention, management, and disposition of these lands," and (3) "compile data necessary to understand and determine the various demands on the public lands which now exist and which are likely to exist in the foreseeable future." The Commission is directed to report the results of its findings to the President and the Congress and to recommend "such modifications in existing laws, regulations, policies and practices as will, in the judgment of the Commission, best serve to carry out the policy" of Congress related to these lands that "the public lands of the United States shall be (a) retained and managed or (b) disposed of, all in a manner to provide the maximum benefit for the general public." 1/

In meeting the above objectives, the Commission has undertaken an extensive study program designed to provide the necessary material and factual basis for making recommendations for the future policies relating to the use and management of those lands retained in Federal ownership. These studies have included detailed review of both the resource and legal aspects of major Federal land management programs on the basis of commodity or use classifications.

In addition, the study program has encompassed specific subjects involving administrative or policy areas distinct

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1/ Act of September 19, 1964 (78 Stat. 982, 43 USC 1391-1400 (1964) as amended).

from commodities or use categories. Finally, the Commission has undertaken two studies related to the third directive outlined in the Act of 1964 noted above, which is to "compile data necessary to understand and determine the various demands on the public lands which now exist and which are likely to exist in the foreseeable future." The first of these, prepared by Robert R. Nathan Associates, Inc. is entitled Projections of the Consumption of Commodities Producible on the Public Lands of the United States 1980-2000. The second study was prepared by Robert S. Manthy and Lee M. James and related the Nathan study and materials developed elsewhere in the Commission study program to probable demands on the public lands. This report, A Study of Probable Future Demands on the Public Lands assesses the probable role of public lands as a future source of supply for each of several broad commodity or use classes.

It is the purpose of this paper to set forth the factors and considerations influencing the interpretation of the data and projections contained in the Nathan and Manthy-James studies and the relationship of these studies to policy questions raised before the Public Land Law Review Commission.

The Semantics of Demand

As noted, the legislative act creating the Public Land Law Review Commission specifically calls for an assessment of the present and future demands on the public lands, with the limitation that future demands be viewed as related to the "foreseeable" future. This has been determined by the Commission as encompassing only the period to the year 2000. Within such a framework, however, there is room for many different interpretations and views as to what constitutes "demand" and what types of information are desirable or useful in connection with future policies for public land management.

The existing literature relating to both the public lands specifically and natural resources more generally employ such terminology as "needs", "use", "requirements", "consumption", "potential use", "future production" and "utilization". In many instances, these terms are used in connection with, or interchangeably for, "demand". Although such usage is common,

it is important to note that such connotations of use are not identical, either conceptually or empirically, with demand. 2/

In most instances, there is some attempt to focus on the future through long-range projections of what course of events is "most likely" to occur. Such projections are normally based on extrapolations of past trends in resource or land use. Such extrapolations may be rather simple extensions of recent trends, or may be modified on the basis of assumed changes in basic parameters such as population, income, tastes and preferences, etc. Further, such projections may be established through use of average growth rates or informed judgments of trends on the one hand, or on highly quantified mathematical techniques on the other. In all, or almost all, instances, however, the projection takes the nature of a forecast, estimate, or prediction of what is likely to occur under circumstances either explicitly specified or implicitly assumed. From this standpoint, therefore, such projections are not a prophecy of what will actually occur, since the assumptions may prove to be wrong, and cannot serve as targets or goals to be achieved by either the private or public sectors of the economy.

Projections of use or consumption differ from demand in at least two important ways. A clear distinction must be drawn between the concepts of supply and demand if these are to be functional elements for analyzing public land policies. Projections of use or consumption, however, fail to make such a distinction. An economic interpretation of supply and demand must take into consideration those factors that govern or determine the various quantities of goods and services that the many producers and consumers will exchange at any point in time. Those factors affecting the aggregate decisions or producers are quite different from those governing decisions of consumers. Supply, in the economic sense, relates to the output decisions of individual producers under a range of economic conditions to both price and costs of production. Demand, in a similar manner, relates the varying quantities of goods or services that users or consumers will be willing to purchase under varying price conditions.

2/ For an excellent discussion of these issues see S. V. Ciriacy-Wantrup, "Conceptual Problems in Projecting the Demand for Land and Water", in Modern Land Policy, papers of the Land Economics Institute. University of Illinois Press, 1960. pp. 41-67.

The functional use of the concepts of supply and demand for public policy purposes requires that observed behavior, in terms of the quantity actually purchased at a particular price, be treated not as either "supply" or "demand" but rather as the simultaneous determination of consumption based on both factors. Thus, observed levels of past consumption reflect the quantity that was ultimately supplied by producers, and likewise the quantity that was purchased or "demanded" by consumers under the existing economic conditions. Had any of the numerous economic variables been different, another solution would have resulted, giving a different observed level of consumption. Such a situation does not indicate that either supply or demand has changed, but rather that there may be different solutions to the same basic economic data.

The problem of separating supply and demand variables from observed levels of consumption is difficult conceptually and is even more difficult to do statistically. When the available information is in the form of a time series of observed consumption over some defined period, there is no immediate way to determine whether the observed differences from one point in time to another are due to changes in supply variables, demand variables, or possibly some combination of the two. Changes in income may have affected demand; changes in technology may have affected supply. Supply may have remained stable while demand has shifted; demand may have remained constant while supply has shifted. Demand may have increased, while supply has declined. From simple observations of consumption, there is no way to satisfactorily determine whether there has been a change in demand or supply, without extensively examining other economic parameters.

There is an important difference between a change in demand and a change in the particular quantity of a good demanded at any point in time. While perhaps a minor point of terminology, there are nevertheless important distinctions between "demand" and "quantity demanded" if the economic concepts are to be useful in policy analysis.

Economic analysis has traditionally related "demand" functionally to a number of important variables. These include the price of the goods, the income level, population, tastes and preferences, the availability of complementary and competing goods, the prices of these other goods, and other similar factors. The particular relationship between prices or values, on the one hand, and physical quantities utilized on the other

s of particular significance in demand analysis. As a general rinciple, more of a particular good will be demanded, other things eing equal, at a lower price than at a higher price. Inividual consumers will obtain more of the particular good at lower price and additional consumers not previously buying he good will be encouraged to enter the market.

In a similar manner, producers or suppliers will be enouraged to increase outputs as prices increase. Higher prices llow larger scales of production, the use of more expensive echnology and other factors of production, and other means of ncreasing outputs.

This dual relationship between prices and both supply and emand leads to the concept of supply and demand schedules ather than simple absolute levels. Varying quantities of a ood or service will be demanded at any point in time depending pon the prevailing price level, if other factors remain contant. Similarly, various quantities of the same good or serice will be supplied as price varies. At some unique price evel (the market or "market clearing" price) consumers will emand exactly the same quantity of the good or service that roducers are willing to supply. At higher prices, producers ill be willing to supply a larger volume of output than buyers ill consume. Likewise, at lower prices, buyers will demand a arger quantity than suppliers are willing to offer. In the irst instance, there is an excess supply and price will norally fall. In the second case, there is an economic shortage d price will be bid up until an equilibrium is reached.

The observations of past consumption levels provide an rray of such "equilibrium" points. They do not, however, proide the necessary information concerning either changes in upply or demand, or changes in prices. Only if either supply demand is completely unresponsive to the price variable will uch observations give an unambiguous indication of supplyemand relationships. Such situations, however, are extremely re.

The observed consumption levels are also further clouded terms of their meaning with respect to supply and demand by e very nature of a dynamic economy. As indicated, many facors affect both supply and demand. These factors do not reain constant over time, but are constantly changing. The observed consumption levels represent the combined total effect of the interaction of all such factors in addition to the price variable.

The dual problems of ignoring the interdependence of supply and demand in projecting consumption levels and the lack of adequate consideration of demand as a schedule of alternative combinations of quantity-price relationships seriously limit the use of consumption data alone as a basis for public policy relating to supply decisions.

The important limitations inherent in quantitative long-range projections are recognized in both the Nathan and Manthy-James reports. The Nathan report provides projections of potential consumption levels, conditioned by stated assumptions concerning the trends in economic aggregates affecting both supply and demand. These aggregates included population, labor force, employment, productivity, gross output, industrial production, and personal income. In deriving individual projections of commodity consumption, moreover, critical assumptions were made concerning both price and production possibilities. With only minor exceptions, these projections are predicated on the basis of an assumed continuation of recent trends in relative prices (thus removing the effects of changes in the general price level) and the attendant assumption that adequate supplies will be forthcoming at these relative prices.

The stringent restrictions imposed by such projections were likewise recognized by Manthy and James. They explicitly note that the concepts of supply and demand are used in a conventional or noneconomic sense. It is made clear that these projections "... are not predictions. That is, they are not statements of what will be or of what must be supplied from public lands." 3/

3/ Robert S. Manthy and Lee M. James, A Study of Probable Future Demands on the Public Lands, prepared for PLLRC, September, 1969. p. I-5.

Relevance of Demand to Public Policy

Long-range projections of consumption (often identified as needs, requirements or demand) are commonly made for most resource commodities. Such projections are of varying degrees of detail, but normally encompass single point estimates of consumption at specified future points in time. Occasionally, such point projections are bounded by "high" and "low" estimates, which may or may not be statistically related to the mean projection. In such cases, however, the projected range is not so much a possible demand schedule as such but rather a recognition of the inherent uncertainty of any projection.

The serious conceptual and statistical limitations of viewing consumption projections as demand raises the important question of relevance of such projections for public land policy. The related question of the degree of quantitative precision necessary or desirable for policy purposes is also raised. It has been indicated that most long-range projections fail to meet the requirements of valid demand estimates, at least if demand is to be viewed as an economic concept. Although such projections may be highly quantified, they are not estimates of demand. Moreover, there is some question concerning the relevance of conceptually accurate estimates of demand if this is taken to mean a highly quantified identification of the relevant economic parameters in much the same manner as present consumption projections.

Objectives of Public Policy

The resolution of questions about the relevance of quantitative projections of long-range trends in resource use depends in large measure for their resolution on the objectives of public policy. Resource policy, as traditionally viewed, is concerned with the planning of resource use from the supply side of the economic equation. The Federal Government acts in much the same manner as other suppliers, insofar as the "raw" natural resources are combined with other resources, both capital and labor, in order to secure more desirable forms of output. The Federal Government, therefore, operates a productive "factory" in much the same manner as those establishments in the private sector. It is not always engaged in producing traditional forms of outputs; it also produces socially oriented outputs such as recreation, fish and wildlife, and a high-quality environment. Nevertheless, these outputs require decisions of a production-output nature involving the expenditure of other productive resources just as real as decisions involving more traditional resource uses.

The relationship of demand to the problems of public policy has been well summarized by Ciriacy-Wantrup as follows:

> One may postulate that the main purpose of projections of land and water demand is to serve as basis for public land and water policy. One may submit, then, that some of the most important decisions in modern land and water policy are of a kind which, on their predictive basis, do not require a high degree of quantification. Stated positively, significant decisions are concerned with successive incremental improvements in social welfare that can be projected only in terms of direction of changes, their relative speeds, and their sequence in time. 4/

It is important to note the emphasis on the concept of incremental supply adjustments as a result of public policy. With the possible exception of severe emergency situations (such as cases of national disasters or total war) the output decisions of the national economy (both public and private) are of an incremental nature - not all or nothing choices. Thus, in almost all instances the choice to be made is whether additional increments of particular goods and services are economically feasible, taking into consideration both the existing supply and alternative sources of meeting existing demand.

With respect to the above, it is obvious that aggregated projections of consumption are especially deficient as a basis for making output or supply decisions for the public sector. The feasibility of incremental changes in output is highly dependent on specific market circumstances. Political debates, for instance, concerning whether "more" recreation is needed are meaningless until the decision is reduced to meaningful dimensions. It must be known, in this case, what the existing recreation supply is, what the demand on that supply is likely to be (not the national demand), what the true costs of incremental additions to supply are (including opportunity costs)

4/ S. V. Ciriacy-Wantrup, op. cit., p. 49.

and what alternative sources of supply are potentially available. Similar types of factors are related to all output decisions. Unfortunately, such factors are completely obscured when national or regional aggregate projections of demand are used. The problem is only compounded by uncritical reliance on consumption estimates.

It is common to view projected levels of consumption as future needs or requirements that must somehow be met. Although such projections implicitly assume supply conditions favorable to such consumption levels, the policy implications are often seen as means for supporting those policies that will assure that such levels are met. It is not at all uncommon to see reference to future "requirements" for particular commodities, as if such projected levels were somehow imposed on the economy by external sources. Clearly, there are no such requirements in a freely functioning economy.

Demand, as a functional concept for analyzing public policy, must be viewed as indicating opportunities for the efficient and beneficial use of resources to meet human wants rather than as absolute "requirements." This shift in emphasis away from viewing the Federal Government as the supplier of last resort is essential if future public policy is to lead to socially efficient uses of all available resources. It makes little sense to expend productive resources, including capital and labor, pursuing "requirements" that are not related to economic demands and that cannot be met at economic levels of supply - whether public or private.

Demand, when viewed as indicating opportunities available to the Federal Government for using resources productively, can be a powerful factor in directing the allocation of resources to alternative uses. The Federal Government is faced with two types of allocation decisions. First, and of primary importance, there are decisions relating to the allocation of available resources to alternative uses. Choices must be made between uses, some of which are for the use of the public lands and resources as productive factors in the private sector and some of which are of a social or consumptive nature. Further, decisions must be made as to the extent to which such uses will be pursued or developed. These decisions cannot be made on the basis of simple aggregates. As suggested above, these decisions are essentially of an incremental nature, although their sum effect

might be quite substantial. Decisions concerning the role of the Federal Government in supplying timber, forage, recreation or any other commodity or service cannot be based on national or even regional estimates of consumption. The supply opportunities for these goods and services must be evaluated with respect to individual circumstances within each local area. Economic demand, as well as the potential supply opportunities for the public lands, will likely differ in each instance. Attempts to set production goals independent of these specific factors can only beg the important questions and likely result in inappropriate allocations of resources.

In almost all instances, the Federal Government is only one of several actual or potential suppliers of particular goods and services. Although the role of the Federal Government is often dominant or at least substantial in certain situations, it is easy to overlook the fact that the public lands contribute only a part of the total supply of most goods and services. In this sense, the total supply is not independent of decisions made in the public sector. Under normal circumstances, the private entrepreneur will base his output decisions on both the prevailing market situation and his individual costs of production. But the market situation also reflects the influence of public output decisions. In turn, where these public decisions are largely made outside of the influence of market forces, the private sector cannot rely entirely on the market as a guide to output decisions. In some instances, such as many localized opportunities for recreation, the influence of public supply decisions may be pervasive and effectively prevent the establishment of a private market.

Policy Requirements for Supply Decisions

It was indicated above that most policy decisions regarding the supply of goods and services from the public sector are essentially incremental in nature, and as such, depend upon the economic variables in each particular situation. The requirements for policy formation in such instances are twofold. First, the emphasis must be on the relative direction, magnitude, and speed of change in both demand and the factors affecting supply opportunities. Secondly, policy must be flexible enough to permit the necessary constant adjustment in output decisions. Allocation policies cannot have the objective of achieving some "optimum" allocation at a particular point in time. Rather, policies must be such as to permit the continuous reallocation of resources between uses and users in response to changing forces in a dynamic economy. Preoccupation with highly quantified projections of potential equilibria allocations at specific points in time may well lead to the ignoring of factors much more fundamental to the efficient use of resources. The adaptability of policy systems over time to take into consideration dynamic changes in demand is a necessary prerequisite to the efficient solution to supply decisions.

One of the primary indicators of changing demand is the trend in relative prices of particular goods and services. Many outputs of the public lands are used as factor inputs for the subsequent production of goods and services, but these lands also provide services of a consumptive nature, such as recreation opportunities. In either case, these goods and services are not used or consumed in isolation. Other productive factors are used or consumed in connection with the public land outputs and these may be either competitive with or complementary to the public land output. In both cases, the demand for the public land output is essentially a derived demand, based on a subsequent satisfaction of human wants. This is true of both "hard" commodity outputs such as timber and minerals, as well as public-oriented outputs such as recreation and an acceptable environment.

Of equal importance is the localized nature of most markets for the goods and services produced on public lands. This is not to say that the ultimately derived products do not enter into national markets but, rather, that the physical location and characteristics of most commodities require that they be utilized either on the site or within relatively close proximity. This is true even for such uses as recreation, where the "consumption" of the recreation opportunity takes place on the site. For these reasons, moreover, it is quite likely that demand conditions of the same uses will vary greatly with respect to different public land areas, even where the physical nature of the good or service is essentially homogeneous.

This recognition of variable demand conditions by geographic location or market area is based on two factors. First, the aggregate size of the local market, the cost situation of the individual consumers, the availability and cost of both complementary and competitive factors of production, and

similar factors affecting demand are quite variable by location. Secondly, on the supply side, important differences in both the alternative demands for the resources (opportunity costs) and the ultimate product values associated with goods and services related to the immediate outputs from the public lands are likely.

The combined effect of the above factors is that the relative values of the goods and services are almost certain to vary widely from region to region and market to market. Where the physical characteristics of the commodity (or service) are relatively homogeneous, it is important to distinguish between relative values. A ton of coal, a thousand board feet in a Douglas-fir peeler, or a day at a campground is not the same economic commodity in different locations. A certain level of demand may exist in one location while essentially similar physical resources or opportunities may go unutilized under different market circumstances. This does not indicate "waste" or "underutilization" but rather the fact that the market weighs all economic factors affecting demand rather than looking at one factor alone.

The fact that economic demand will vary significantly with respect to location regardless of physical resource characteristics can lead to some seemingly inconsistent situations. Unless the underlying factors are fully comprehended, policy prescriptions can be distorted. For example, a relatively poor recreation site, measured in physical terms, that is located adjacent to large concentrations of population may be considerably more valuable than a high quality site (again in physical terms) located in remote or inaccessible areas. A simple index in physical terms, coupled with aggregated estimates of "demand" for recreation, may well result in a higher priority being assigned to the physically attractive but economically inferior site. Similar situations can be identified for practically all goods and services derived from the public lands.

The above factors clearly indicate that demand must be viewed within the context of regional or local markets for the goods and services produced on the public lands. A subtle, but important, distinction must also be made between the good or service actually produced on the public lands and the product ultimately derived from the use of these resources. The demand for housing, or even lumber, is not the same as the demand for standing timber. Although the demand for standing timber is ultimately derived from the demand for lumber among other things, the factors leading to ultimate resource values are quite different.

A second important consideration bearing on the relevance of demand is also often overlooked. The demand for a particular resource or productive service cannot be interpreted independent of the alternative opportunities for using those same resources. Most of the resources available from the public lands can serve a variety of uses. The situations where a particular landholding or resource base will economically serve only a single function are relatively rare. This alternative use is normally measured by the opportunity cost incurred through a particular allocation. If resources are allocated for timber, for example, other potential uses may be reduced at least in part. Over some range of use, recreational opportunities may be reduced qualitatively if not quantitatively. In such situations, the measure of commercial timber values is insufficient as a basis for resource allocation. It is necessary to know that the resources have a positive value when used for this purpose; it is also necessary to know if this is the most economical use presently or potentially available for those resources. In a very real sense, it is the relative value of alternative uses, rather than the absolute value of any single use, that will determine the economically efficient allocation of resources.

In the same sense that the demand of individual goods and services will vary by location, it is equally certain that the opportunity costs will also vary. To illustrate this point, consider that two stands of timber may have identical characteristics with respect to timber volume, species composition and quality, ease of logging, accessibility to markets, competitive interest, and other pertinent factors. In such a situation, and ignoring the opportunity costs, it would be expected that the value of the timber would be practically identical. The introduction of opportunity values, however, can effectively upset this balance. The timber stand has potential value for many other uses besides commercial timber. Among these would be watershed protection, fish and wildlife, recreation, minerals, and possibly forage. To carry the above illustration further, assume that one stand is located adjacent to a large community dependent upon the area as a watershed, while the second timber stand is remote and drainage or water

yield is lost immediately to unutilized streams. As noted above, the timber may have identical value for commercial timber purposes, yet obviously have very different values from a broader perspective. An allocation on the basis of the absolute value for timber might well lead to a socially inefficient use. The comparative or relative value is controlling. As commonly employed in most resource literature, this would indicate the "highest and best use" under prevailing or anticipated conditions.

Determinants of Supply Opportunities

As noted previously, the concept of demand is most functional if interpreted as a range or schedule of opportunities available for utilizing the resources from the public lands. Of equal importance, however, is the relevance of those economic factors affecting the implementation of programs to make the resources available. Just as demand represents a schedule of quantity-price relationships, indicating the quantity of a particular good or service demanded at varying price, the concept of supply can be similarly viewed. Under fixed conditions of production, a higher market price will call forth additional quantities of most goods and services. Producers will expand output to the point where the price (or value) just equals the incremental or marginal costs incurred. Because of the economic situation of declining marginal returns per unit of input, additional increments of output beyond a certain point will be increasingly expensive. These units will be economically feasible only as the unit value increases. To provide these units without an increase in unit value would result in the wasteful expenditure of the combined factors of production, in spite of the fact that the incremental units had a positive value.

Production opportunities or supply from the public lands are equally subject to increasing marginal costs. Further, the cost of supplying various outputs not identical by geographical location. Under favorable supply conditions, resources may be made available at substantially different cost than under less favorable circumstances. Just as the production of commodities within the private sector of the economy is more favorable at specific locations , it is to be expected that the factors favoring public production or supply will vary geographically. What may be an economic level of output under one set of circumstances may be highly uneconomical under different supply conditions in another region, even where the physical resource characteristics are the same. It is the combined effect of all determinants of supply, not just the physical resource, that determines the economic level of production or output. Just as the aggregate measures of consumption were noted as being insufficient to measure demand, the physical availability or presence of resources does not indicate an economic supply. Physical resources are not necessarily economic resources. This distinction, while perhaps obvious, is nevertheless often overlooked in natural resource policy discussions.

If resources and uses of the public lands are to be economically efficient, recognition must be taken of the variance in both demand conditions and supply factors within individual resource markets. It is simply not economically feasible to develop or utilize all physical supplies, irrespective of the costs involved. To do so would certainly involve the wasteful expenditure of equally scarce resources, including capital and labor.

Economic Considerations for Public Supply Policies

In the historical past, the supply decisions regarding the use of the public lands were rather uncomplicated. To a large extent, utilization amounted to "mining" the available resources through extraction, expropriation, or onsite use and resource values were largely determined by a dominant use. The relative abundance of resources did not create conditions of scarcity, and the choice among alternative uses was not a significant aspect of policy. Under these conditions, the costs of extraction or utilization were controlling. Little or no cost was incurred by the public in making supplies available, at least in terms of out-of-pocket costs. A positive absolute value for a particular resource use was normally sufficient to assure the desired allocation.

The days of simplicity in resource allocation have all but disappeared. The "highest and best use" is nowhere as obvious as it was in the past. The importance of alternative uses, coupled with increasing scarcity, have negated the adequacy of supply or allocation policies based on simple physical characteristics of resources. New concepts, employing economic

rather than physical criteria, are increasingly required as an integral part of resource policy if the public lands and resources are to be used efficiently from both the public and private point of view. The considerations relevant to such policies have been suggested above. But before turning to their application with respect to current resource questions, these factors are reiterated here in order to provide a common focus to the interrelated questions of future demand and the supply response of the Federal Government.

1. Consumption is not identical to demand.

Projections of long-range consumption do not provide a satisfactory substitute for the careful evaluation of demand opportunities related to the public lands. The failure to separate supply and demand factors constitutes a significant limitation on the usefulness of consumption projections for policy purposes. Further, the failure to recognize adequately the functional relationship between supply price and demand limits the usefulness of such projections in policy analysis.

Limitations on the usefulness of commodity consumption projections also invalidate any "requirements" approach to planning supply factors in the public sector. The projected consumption estimates are not "requirements", but only single possible levels of consumption dependent upon specific supply and demand conditions. The view of the Federal Government as the supplier of last resort is detrimental to the establishment of socially efficient use of the public land resources.

2. Public policy not dependent upon quantitative productions of demand.

If the objective of public policy is taken as being oriented towards using public land resources to meet economic demands -- that is, demand is the "end" towards which use is oriented -- it is important to view demand as representing resource use opportunities rather than "requirements". Demand in this framework is a concept whose primary function is to assist in the planning of production or supply. Actual production or supply decisions must be made within the context of local market conditions, including both economic demand and factors affecting the economic feasibility of supply. These conditions will vary geographically for all commodities and output decisions cannot be made at the aggregate level. What is required, however, is a guiding policy that will permit the necessary flexibility in output or supply decisions in order to respond to changing supply and demand situations.

Under the above conditions, highly quantified projections of national or aggregate consumption are of limited usefulness. In many situations, such projections only lead to debates concerning the "appropriateness" of the particular numbers used. These projections can never realistically be interpreted as production goals and cannot serve as the orientation for public policy. Even if such projections were actually accurate in the sense of representing future supply and demand equilibria, they would not constitute a valid basis for policy. The goal of policy should not be to achieve an "optimum" allocation of resources at any single point in time. Rather, policy must provide the necessary guidelines and flexibility to assure that resources will continuously be reallocated to their best use. In a dynamic economy, optimal allocations are constantly changing. Allocation patterns that are frozen or highly inflexible will certainly reduce the overall efficiency in using public lands.

3. Aggregate supply policy must be nonspecific in terms of outputs.

Aggregative policy at the regional or national level can never achieve uniformity in terms of criteria for specific output decisions if these criteria are based on commodity outputs. The national or regional role of the public lands, while capable of being viewed in an aggregate sense, is in reality the composite effect of individual supply and demand situations. Decisions regarding supply must be from the "bottom up"; that is, they must be based on the individual circumstances of supply and demand within specific markets for each commodity. Output decisions or "production goals" imposed as commodity "requirements" unnecessarily restrict the flexibility needed to use resources efficiently. Such decisions "from above" cannot effectively replace local analysis of supply opportunities and the planning of output decisions on that basis.

Aggregate policy, on the other hand, must provide adequate recognition of generalized trends leading to different demand situations. These trends include the general direction

of change in resource use, the potential magnitude or ordinal characteristics of change, the speed of change or sequence in time, and the probable duration of observed trends. Aggregate projections, both of consumption and of the role of public lands, can be extremely useful in this regard. However, the emphasis must be on the relative measures of values and the direction, magnitude, and speed of change rather than on the degree of quantitative precision. The numbers themselves are only marginally related to policy decisions; the trends they reveal are highly significant.

4. Specific output decisions must reflect relative values.

If reasonable efficiency is to be attained, and maintained, in the use of the public lands and resources, both supply and demand must be interpreted in terms of relative values. Public output decisions -- that is, supply decisions -- must of necessity reflect the relative values of the goods and commodities produced as well as the real costs of production. These relative values, moreover, should adequately reflect all external costs and benefits associated with the production of specific goods and services. Since output decisions are incremental, it is the marginal resource values and costs that are relevant. Average or aggregate values are clearly insufficient to assure efficient resource allocation. Further, these relative values must be specific to prevailing conditions in localized resource markets, reflecting both the regional differences in public land resources and variable market values.

Relative values are a prerequisite both to decisions relating to the allocation of resources to alternative uses and to those concerning the extent or degree of development for any single use. The need for greater consideration of relative resource values in connection with basic policy questions, and ultimately in making supply decisions, is a factor not revealed by quantitative trend analysis. In almost all situations, such trend analysis merely assumes that either relative prices will remain constant or, alternatively, that recent changes in relative values will continue into the future. Both assumptions can be seriously questioned with respect to the projection of consumption and/or demand for individual commodities.

In addition to the factors noted above, there are two additional considerations that will be increasingly important in relation to policy decisions affecting the output of goods and services from the public lands. The first of these relates to the impact of public policy itself on demand. Secondly, the probable impact of other socio-economic constraints on resource activities cannot be ignored.

It was noted previously that total economic demand for the various goods and services from the public lands is not independent of public policy. This interrelationship includes both policies governing activities on the public lands as well as more general policies not specifically oriented to resource programs. Two important policy areas in the first category are of particular importance: policies relating to pricing of goods and services from the public lands and policies of a nonmarket nature affecting the allocation of resources to particular uses or users.

The role of pricing of public land resources has a profound impact on economic demand. As noted, demand is normally used to represent the schedule of relationships between quantities of goods and services desired and price. In order to achieve optimal consumption choices, resource prices must adequately reflect relative values. Prices assist both consumers and producers in making rational resource decisions. Where prices do not reflect resource values, the allocative function of pricing is distorted . Instead of assisting in making economic choices, such pricing policies may in fact lead to arbitrary and uneconomic resource use. Where pricing policies lead to prices below market value, excessive use will be encouraged, leading to wasteful use of resources and an overall reduction in welfare.

In a similar manner, policies of an administrative nature affecting the allocation of resources to particular uses or users may distort economic measures of resource value Policies granting priorities in use, physical restrictions on use, protective or noncompetitive allocations, or the use of physical or biological formulae all distort relative resource values. As with nonmarket pricing, these forces will affect the level of demand for those favored uses or by those privileged users.

Nonspecific public policies relating to public goals or objectives may also have significant impacts on resource demands. Institutional factors such as credit and export policies, tariffs, taxation, and business regulation all alter

economic demands. Further, the general effects of national monetary and fiscal policy cannot be ignored.

In any analysis of future demand for particular commodities, these institutional and policy factors cannot be ignored. In many cases, the implications of these factors can be equal to or more important than the traditional economic determinants of demand.

Another important policy implication of a similar nature arises in connection with the social or sovereign activities of the Federal Government. In some instances, the Federal Government may choose to pursue certain specified objectives as a matter of social policy. These actions can cover a wide variety of purposes, including the redistribution of income, providing economic assistance, providing for the distribution of certain goods and services to particular classes of users, and maintaining or preserving certain social values. In many instances, the programs and activities related to the public lands are viewed as effective vehicles for pursuing these unrelated social objectives. In most instances, however, this course of action represents only one alternative means of promoting the desired goal. An example of such a policy situation would exist in the political decision to make predetermined levels of recreational opportunities available to the general public. This end or objective can be pursued in several ways. First, the public lands can be utilized as a location for recreation opportunities. Second, the Federal Government can undertake programs to encourage the provision of recreation through the private sector. Finally, programs can be implemented to stimulate and aid non-Federal units of Government to provide additional recreational opportunities. The important fact in such situations is that direct provision by the Federal Government through public land programs is not the only alternative. The supply response, however, is quite likely to have different implications for recreation demand depending on the course of action pursued.

The second consideration noted above --resource demand-- is related to the probable impact of socio-economic constraints on resource activities. The Federal Government has long maintained differing forms of regulation on the exercise of private property rights. Such regulations have taken many forms, both legal and economic. One form of constraint, however, is worth noting -- the increasing concern for maintaining environmental factors.

A quality environment is rapidly becoming a desirable objective of public policy. To a large extent, the environmental problems most evident today are the result of imperfections in legal, institutional, and economic systems governing the exercise of private property rights. From an economic point of view, the externalities or "spillover effects" of resource use have increased to the point where they cannot be ignored. It should be apparent that such spillovers are not new, but have long accompanied the use of resources. In the past, however, the manifestations of these external effects have been minimal. As these costs have become more concentrated, and hence more visible, increasing concern is expressed over ways of reducing or eliminating the undesirable forms of externalities.

Environmental problems are not subject to easy resolutions. In many instances, the cause and effect relationships have not been established, thus preventing a direct identification of social costs with certain actions. In other cases, the technical relationships of resource use are incompletely understood, thereby preventing a complete accounting of potential social costs. Although it is known, or assumed, that spillover costs will occur, there is not always a satisfactory measure of what these costs are or of what the total effect will be under known conditions.

The traditional approach to environmental problems has been to attempt to impose the relevant costs on the resource user rather than on society. Where the resource use is not closely identified with both social and private costs, the user will not likely consider the external impacts of that use. When these costs are brought to bear on the user, however, they will be taken into consideration in those decisions related to use.

In many instances, however, it is not practical or possible to transfer the social costs back to those responsible for their existence. In such instances, the alternative is direct regulation of use, with certain forms of use prohibited, or perhaps modified, in order to assure that undesirable spillover effects do not become significant. In this regard, these regulatory policies do not differ greatly from other types of regulations imposed on the exercise of property rights. They can, however, have an important effect on the demand for

particular resources or resource uses. Such regulatory control of use normally increases the cost of resource utilization, either through imposing the social cost on the user or by prohibiting certain practices or forms of use that might otherwise be economically preferable from the viewpoint of the user. Because of the functional relationship between prices and the quantity of a product, good or service consumed, any regulatory practice will ultimately affect demand. Such constraints, based on environmental considerations, will undoubtedly become of increasing importantance in resource decisions, including those related to the public lands.

In summary, the economic considerations relevant to public supply policies require a fundamental shift in the interpretation of demand away from the notion of output requirements towards a view of demand as representing the available opportunities for resource use. Projection of physical trends, without a separation of supply and demand variables, has little usefulness for public policy purposes. Nevertheless, such trends can provide a necessary insight into the direction, magnitude, and speed of changes in resource use. These shifts will play an important role in shaping broad aggregate policy, but cannot substitute for the increasing use of relative values based on specific market situations for the allocation of resources at the operational level. The important impact of public policy itself on the demand for resources cannot be ignored. Neither can the alternative means of meeting social objectives be neglected at the expense of increasing pressures on the public lands. Finally, the probable impact of environmental constraints on resource use can alter significantly the patterns of demand that would otherwise prevail. Supply policy must be dynamic, constantly adapting to changing economic forces if resources are to be used efficiently. Flexible policies, coupled with economic supply responses, will help to assure that the public lands continue to play an integral part in the resource economy of the country.

Projected Trends in Resource Use and Implications for Public Supply Response

As has been noted, the Public Land Law Review Commission is directed by law to examine the probable trends in resource use in connection with determining the "various demands on the public lands which now exist and which are likely to exist in the foreseeable future." As indicated in the previous sections of this paper, the Commission has undertaken two related studies in carrying out its legal directives.

The study of Projections of the Consumption of Commodities Producible on the Public Lands of the United States prepared by Robert R. Nathan Associates, Inc. was intended to provide the necessary background and projected trends required for proper interpretation of the future potential for resource use on the public lands. This study, although utilizing considerable quantitative information, was neither a forecast of what would necessarily happen by the target years of 1980 and 2000, nor a prescription of the various quantities of the individual commodities required. As indicated in that report, the projections are predicated on major assumptions concerning economic parameters, including population growth, gross national product, labor force and employment, productivity, and personal income, as well as implicit assumptions concerning tastes and preferences, relative values, production costs, and related factors. Under these conditions, the expected levels of supply-demand equilibria were projected.

The major parameters used in connection with the Nathan projections are related to factors influencing demand. A primary condition, however, relates to the assumption that relative prices will continue to follow the recent historical trends. Such an assumption has important implications for both supply and demand. On the demand side, this assumption means the recent trends in the rate of substitution between competitive products, the composite package of consumer tastes and preferences, and the relative price elasticities of demand will continue in the same relationship. On the supply side, this assumption means that all pertinent factor costs (and availability), production technology, factor productivity, and related costs of production will continue on the course represented by past trends.

The primary effect of the above assumptions is to eliminate from explicit consideration the role of prices in both demand and supply decisions as well as general implications of elasticity which is a measure of the responsiveness of supply and demand to changes in unit values.

Because of these factors and the limitations noted earlier in this paper, the Nathan projections do not constitute schedules of output required by the national economy in future years. These projections, however, do provide an insight into the direction and magnitude of change that may likely occur under the stated conditions. From this standpoint, these projections are most useful if interpreted from a general rather than a specific frame of reference. The numerical parameters of the projections, while perhaps interesting, are not readily adaptable to policy purposes, and furthermore, cannot serve any useful purpose in prescribing supply response from the public sector.

The limitations on quantitative interpretation of the Nathan projections, and their usefulness as general indicators only, was recognized in the Manthy-James study. This fact was stressed both in the preliminary introductory discussion and was repeated in connection with the concluding analytical chapter.

Based on the magnitudes expressed in the Nathan report, as conditioned by other relevant information, the Manthy-James study provides the necessary comparison between both past and present relationships of total commodity consumption to public land outputs, and the likely future trend under certain assumptions. In practically all instances, the Federal Government provides for the direct output of some part of the total supply of the various goods and services through its public land policies. In some instances, this role may be minor from the national perspective, as in the case of livestock forage. In other instances, the role of the public lands in connection with total national supply may be quite significant, as in the case of timber. In both instances, however, it is not the relationship to national supply that is relevant for policy purposes. What is of paramount importance is the economic relationship between supply opportunities available for the public lands in numerous local resource markets and the policy response of the public sector. Analysis of such a response cannot be predicated on the basis of national aggregates. Relative resource values, representing the existing market relationships, will determine the overall economic feasibility of particular output decisions.

The Manthy-James report, therefore, provides a necessary insight into the fundamental relationship between total projected consumption and the probable supply opportunities available through public land policy. The projected levels of consumption are obviously conditioned by the assumptions made relative to future supply, a part of which is normally forthcoming from the public lands. In this sense, these projections of consumption are not independent of public policy. Nevertheless, the projected consumption levels provide the necessary focal point for examining the probable opportunities available for the use of public lands. These supply opportunities, and the public response, are conditioned by the several factors noted elsewhere in this paper.

The general indicators of probable trends, and the relationship between these trends and public output levels have been summarized by Manthy and James by commodity classification Their conclusions are largely ordinal rather than numerical. In the discussion below, these conclusions are discussed briefly in terms of those important factors relating to the probable demand and the supply considerations pertinent to public policy.

Agricultural Use of Public Lands

The economic demand for agricultural crops is closely related to two factors: population and per capita income. As a result of increases in both of these factors, the demand for agricultural products has increased substantially in recent years.

In spite of the increased economic demand for agricultural crops, it is generally recognized that the demand for agricultural acreage has not increased in the aggregate, and has actually shown an absolute decline in many instances. Under the assumed conditions, the Nathan study projects consumption of all grains to increase by about 19 percent between 1965 and 1980 and by about 46 percent by 2000. Per capita consumption is expected to decline by 13 percent by 1980 and by another 7.6 percent between 1980 and 2000 for wheat products.

Consumption of other grains is projected as increasing slightly on a per capita basis between 1965 and 1980, but then declining by 2000. Similarly, domestic use of cotton is projected to increase only slightly, by about 13 percent, by 1980.

As noted by Manthy, while farm output has increased by some 42 percent between 1950 and 1968, the acreage used for crops has actually declined by about 10 percent. This decline has largely been the result of greatly expanded agricultural productivity brought about by advances in farm technology. As a result, some 60 million acres have been withdrawn from active agricultural use through Government diversion programs.

Projected acreage of lands for the seven major food and livestock-feeding crops likely to be used for active agricultural production in 1980 is between 180 million and 213 million acres as compared with about 193 million acres in 1968. The expected idle acreage (for these crops) is estimated as ranging from 38 to 71 million acres in 1980, assuming a continuance of market controls for agriculture. Projected acreages for 2000 were more uncertain, but as reported by Manthy, there is no expected shortage of cropland, especially when the non-Federal lands suitable for agriculture but presently not used for these purposes are considered.

On the basis of past trends and the general indications of future agricultural use of croplands, it has been projected that the public lands will not be under any great pressure for agricultural uses. Cropland requirements are expected to be such that public lands will be economically demanded in only isolated instances. Nevertheless, these situations may be quite important within the scope of selected regional economies.

The relevant factors responsible for this conclusion can be summarized briefly. The historic disposal policies for the public lands assured that the majority of productive agricultural lands passed into private ownership, largely prior to the passage of the Taylor Grazing Act in 1934. The lands remaining in public ownership after that date were mostly submarginal for dryland farming purposes. The rapid advances in agricultural technology have assured that most of the public lands remain submarginal for dryland agricultural purposes. Nevertheless, there may be important instances where public lands can be used economically for agricultural purposes. This may be true where no overall increase in agricultural acreage is expected as well as in the potential situation where additional lands may be required.

The lands that were to be ultimately used for agriculture were determined largely by economic conditions of the first third of this century, during which time agricultural use of lands reached its highest level. The expansion of agricultural acreage preceded the closing of the public domain to free entry and the following advances in agricultural technology. The growth in agricultural markets, the geographical distribution of population growth, and changing tastes and preferences for agricultural products all indicate that the earlier marginal conditions determining the total level of agricultural land use may no longer apply in total. And in some cases, lands that were previously uneconomical for agricultural production may have productive potential under today's conditions.

Local economic conditions, together with advanced technology, can determine the feasibility of agricultural use of public lands in spite of a general decline in agricultural acreage. The development of regional agricultural markets in the West, and the specialization of certain areas as producers for the national market may make agriculture profitable in regions previously thought submarginal. Although the acreage in this category is probably quite small (estimated for PLLRC as approximately 2.2 million acres), such use can be economically important to local communities.

The agricultural potential of these lands, however, must be evaluated on the basis not only of agricultural crops but also of the alternative demands for land use. While many of these lands are perhaps not suited for other public uses, the acreage contained in national forests, national parks, various recreation areas, and perhaps military reservations are unlikely to be made available for agriculture except on a selective basis.

Two important considerations outside the scope of public land policy will also have strong implications for the feasibility of using these lands for agricultural purposes. The first relates to the various support programs for agricultural crops. Under these programs, the market prices for some agricultural crops are distorted, with prices maintained above the market-clearing level supported on equity grounds. The economic consequences of these policies has been quite evident, however, as seen in the increased incentives for production, the stimulation of intensive production (thus increased productivity) on smaller

acreages, and the accumulation of excess or surplus production. Under such support programs, lands that would otherwise be submarginal will appear economically feasible for agriculture when only the private costs and benefits are considered. Such supported use, however, may be clearly uneconomic from a social point of view.

A second policy implication relates to the use of irrigated lands for agriculture - or more specifically, the provision of irrigation water for the development of arid lands. A great deal of criticism has been directed towards many water development projects, holding that the irrigation use of developed waters was heavily subsidized and thus encouraged uneconomic (and unnecessary) agricultural production. Where the irrigation use is not subject to full development charges (including water values in addition to the costs of delivery), submarginal lands will again appear to be profitable for agricultural development. With increased demands on water supplies in the Western States, this potential factor assumes great importance. A great deal of the potential agricultural land identified for the PLLRC can be developed only through irrigation. While many irrigation projects will obviously be economically feasible, the indiscriminate development of irrigation potential through public subsidy will undoubtedly lead to uneconomic demands for public lands for agricultural purposes. In some instances, this demand may be combined with the production of supported crops, thus involving a double subsidy for agriculture.

Forage Resources

The use of forage resources on the public lands is normally identified with livestock grazing, the single largest use. Nevertheless, the total use of forage is much broader, and includes use by game and wildlife, although these uses have been separated for analytical purposes. With respect to livestock, the demand for forage is a derived demand, ultimately tied to the economic demand for livestock products. As with crops, the demand for livestock products is closely correlated to trends in per capita income and population.

The principle consumption of meat products has been projected by the Nathan study as increasing by about 52 percent by 1980 over 1965 levels and by some 170 percent by 2000. For classes of meat products, the expected trends are variable.

The consumption of beef is projected to increase over 60 percent by 1980 and almost 187 percent by 2000. In comparison, the consumption of veal is projected to decline 50 percent by 2000. Consumption of lamb and mutton is also projected to increase, but only slightly in comparison with beef. Projected consumption in 2000 is only 59 percent above the 1965 level.

The derived demand for public land forage for livestock purposes will ultimately depend upon the competitive position of the grazing industry of the Western States. This competitive posture, in turn, will depend on a number of important variables. Primary among the important considerations is the trend in numbers of animals, and the geographical distribution of the livestock industry.

Recent trends in livestock herds reflect the trends in meat consumption. The total population of forage-consuming cattle in the United States increased about 88 percent between 1950 and 1966. At the same time, the number of stock sheep and lambs declined by some 18 percent. The 11 Western States accounted for a significantly smaller share of forage consuming cattle in 1966 than in 1950 (21 percent vs. 37 percent) but a slightly larger share of stock sheep and lambs (46 percent vs. 44 percent). The declining relative share of cattle, however, masks the fact that the total cattle population in the Western States increased moderately, by a total of 45 percent over the 16 year period.

The relative importance of forage will also be conditioned by the use of alternative forms of feeding. As noted by Manthy, forage is only one of three major forms of feed - the others being concentrates and mechanically harvested roughage. The overall trends in feed consumption have been surprisingly constant. As reported by Manthy, the relative distribution in 1966 was 46 percent concentrates, 18 percent harvested forage, and the remaining 34 percent from pasture and range. This distribution closely approximates that for 1950.

The public lands in the West have declined in importance as a source of forage - both in absolute and relative terms. The overall supply of AUM's from the public lands declined slightly between 1947-1966, while the relative share supplied by the public lands in the Western States declined almost

37 percent. Overall, the importance of public forage declined nationally by about 50 percent.

If the number of AUM's permitted on the public lands remains relatively constant (a continuation of recent trends), the overall relative contribution of public land forage will decline further. As projected by Manthy, the national role of public land forage can be expected to decline from 3.0 percent in 1966 to just over 2 percent in 1980 and to between 1.3 and 1.6 percent by 2000. Similarly, the regional importance in the Western States will likely fall from the 12 percent supplied from public lands in 1966 to about 9 percent in 1980 and between 5.2 and 6.6 percent by 2000.

The trends in overall importance of public forage, however, fail to identify the regional importance of the public land forage for individual communities and ranches. Because of historic policies governing the disposal of public lands and the existing systems for the allocation of grazing privileges, the public lands often constitute a critical portion of the feed requirement potential for many livestock operations. These lands are often utilized in connection with private lands, each complementing the other, with respect to both forage potential and season of use. Under these conditions, the forage value of the public lands is highly dependent upon the complementary use of private lands when cattle cannot be maintained on public lands. The opposite situation, of course, is also true. The private lands would often be inoperable for livestock use without the availability of public rangelands.

Because of unique physical characteristics of much of the grazing land of the West, the interdependence of public and private lands, and the lack of significant alternative uses, the greatest bulk of the public lands used for grazing purposes can be expected to continue in this use. Although these lands will quite likely provide a decreasing proportion of all forage requirements, they will nevertheless remain critical to the economic well-being of local communities and operators. There will be important instances where alternative uses will increase in value, leading to pressures to reduce or modify grazing use. These marginal adjustments will obviously relate to both recreational and environmental factors. Further, increased scarcity of economic water yields may ultimately lead to modifications of grazing practices on some portions of the public lands. Although these lands are not presently significant in terms of overall national water yields, they may play an increasingly important role in the future. These same water yields, however, are often of critical importance locally.

Important policy factors relating to the economic demand for public forage can also be identified. Of primary importance are the terms and conditions of use, primarily those relating to fees, tenure, and indirectly, to investments in range improvement. All of these factors affect the operating costs of the individual operation, and hence, the ultimate competitive position of the general segment of the livestock industry that relies on the public lands for some portion of its feed requirements. In this sense, this segment of the industry is in competition with other livestock producers. Any policy that affects these operators differently than other segments of the industry will alter the competitive relationship.

Other factors of public policy will also be important in relation to the economic demand for forage. Since the demand for forage is ultimately linked to the demand for livestock products, these markets will be controlling. Policies relating to livestock markets will, therefore, be of importance to the production of forage. A primary policy in this category is the use of import quotas and tariffs for livestock products. At the present time, the price level for domestic livestock products exceeds the world market price. There are strong pressures to maintain current restrictive practices on the importation of meat products.

Fish and Wildlife Resources

The category of Fish and Wildlife Resources does not, in itself, constitute a commodity (good or service) produced on the public land distinct from other activities. As noted in the previous section, the demand for forage on the public lands is governed in part by wildlife populations and policies providing for wildlife habitat. Similarly, the enjoyment of wildlife and fish resources, of either a consumptive or nonconsumptive nature, is closely associated with outdoor recreation opportunities supplied by the public sector. For this reason, the factors affecting the production of fish and wildlife (as distinct from those governing the "use" of these resources) are treated in this section. The "consumptive" and "nonconsumptive" demands are noted below in relation to outdoor recreation.

The public lands provide a significant habitat for fish and wildlife populations. These populations are characterized by their fugitive nature - that is, they are not fixed in location as are most resources. These populations often migrate across property lines, spending varying proportions of their life cycle on public lands. For this reason, the Federal Government faces two distinct sets of policy questions. First, there are many important questions relating to the protection, maintenance, and development of habitat suitable for fish and wildlife populations. These questions are largely independent of the second area of policy - the regulation of these resources in order to provide opportunities for their use and enjoyment, be it consumptive or nonconsumptive. In many instances, the public lands will be important for the production and protection of fish and wildlife, while the actual "use" of the resource takes place elsewhere. Such external use, however, is not possible without the ultimate provision of suitable habitat.

As reported to the PLLRC by the administrative agencies, there are some 12.5 million acres of Federal land, including fisheries, that are primarily designated for the protection, production or feeding of wildlife. The greatest proportion of this acreage is managed by the Bureau of Sport Fisheries and Wildlife as migratory bird and waterfowl refuges, game refuges, and sanctuaries.

Reliable information concerning total habitat available for fish and wildlife populations is extremely limited. Nevertheless, estimates, which are subject to question and ultimate qualification, made by the Department of Fishery and Wildlife Biology at Colorado State University for the PLLRC are instructive as indicators of probable magnitudes involved. For the 20 states surveyed, it was estimated that the public lands comprised approximately 37 percent of the land area, provided between 40 and 48 percent of the big game habitation, and highly variable proportions of habitat for migratory waterfowl, upland birds, small game, and fur bearers. In terms of fish habitat, the 20 states surveyed contained about 14 million acres of inland sport fishing waters, of which about one-third was federally-owned. Federal ownership was relatively greatest for cold waters, while warm waters were primarily owned by non-Federal public agencies.

The economic variables related to the provision of fish and wildlife habitat are not always clear. This is due in part to the institutional aspects of public policy related to such resource use. Further, the problems mentioned above related to the distinction between the provision of habitat on public lands, on the one hand, and the provision of services related to fish and wildlife use on the other are not always recognized. Hopefully, the provision of habitat will ultimately lead to the benefits or services secured from the resulting fish and wildlife populations. This distinction, however, is somewhat artificial, as is the assumed relationship between the provision of habitat and resulting values. The provision of habitat, and the protection and maintenance of fish and wildlife populations, is largely a social and political decision. The protection of endangered species, for example, is the result of public value judgments that such species should be maintained and is largely independent of economic considerations. Preservation, in this instance, is assumed to be a social benefit, independent of private benefits accruing to individuals using public lands.

As noted in the Manthy study, it is extremely difficult to make meaningful projections as to the amount of fish and wildlife habitat that will be economically demanded by society. It is obvious, however, that these pressures will in all likelihood increase, and that they will be increasingly focused towards the public lands. The reasons for this are several. The fugitive nature of fish and wildlife, and the implicit fact that the control of populations is beyond the economic reach of most individual property owners, almost assures that the maintenance of habitat will become increasingly a public responsibility. This does not deny the important role of private and nonpublic organizations active in wildlife habitat activities. Rather, this is a simple recognition of the fact that it will be increasingly difficult for nonpublic organizations to justify, from an economic point of view, large investments in habitat maintenance.

Although some level of non-Federal activity can be expected as a reflection of state and private concern, these activities cannot realistically be expected to provide an increased share of total habitat acreage. Pressures on private lands will almost certainly result in an increased concentration of both habitats and game populations on public lands - largely Federal public lands.

Outdoor Recreation

The term "outdoor recreation" usually is employed to cover a widely variable group of activities and, for this reason, there is no such thing as a single definable activity, "outdoor recreation". Rather, there is a heterogeneous collection of individual-oriented activities that are characterized by certain observed characteristics of consumption or use. For the purposes of the studies conducted by the PLLRC, the Nathan report considered recreation in five broad categories: passive outdoor recreation, physically active recreation, water sports, back country recreation, and winter sports.

Quantitative information concerning the "consumption" of outdoor recreation is generally considered inadequate. This reflects the fact that until quite recently there was no concerted effort to measure outdoor recreation activities. Further, there is no satisfactory unit of measure for outdoor recreation. The use of occasions, visits, visitor days, participation days, etc. are all subject to severe limitations when attempting to use the data for economic purposes.

Where information concerning public recreation supply is limited and must be highly qualified, the comparable information for the private sector is even more unreliable. Because of the highly variable nature of "recreation" and the lack of any central unit of measure, most "estimates" of use and/or projections are more in the realm of speculation. Although important improvements have been made in recent years in measuring recreational activities, these improvements have in themselves lead to uncertainties concerning "observed" past trends. In many instances, there is some question whether observed changes are really changes in use, or alternatively whether they simply imply more comprehensive reporting, changes in methodology, or some other random factor. In any case, the reported trends must be interpreted in qualitative rather than quantitative terms. Qualitative indicators are perhaps suggestive of trends; they are certainly inadequate as predictors of actual levels of use.

Projections of outdoor recreation participation have been made in the Nathan report, and have been compared by Manthy with projections made by the Bureau of Outdoor Recreation. According to these studies, as well as other published sources, the participation in outdoor recreation has increased rapidly in recent years, and furthermore, can be expected to increase significantly in the foreseeable future. The Nathan report indicates that total participation in major outdoor recreation activities will likely increase by 60 percent between 1965 and 1980 and by 141 percent by 2000. This compares roughly with estimates of 56 percent and 160 percent made by the Bureau of Outdoor Recreation. Projected trends vary significantly by type of recreational activity, with water skiing showing the highest projected increase, followed by camping and hiking, with fishing showing the lowest.

The past role of the public lands in supplying recreation opportunities is not clear. This ambiguity is partly attributable to the measurement problems noted previously. It also reflects the many difficulties encountered when comparisons are attempted between independent data series.

The Manthy report has concluded that some 40 to 50 percent of public recreation occurred on Federal public lands in 1960. It has been noted by the Department of the Interior that this comparison is perhaps misleading, in that public recreation taking place in municipal areas is ignored in the 1960 reported figures. According to Department of the Interior estimates, the correct proportion, considering all public recreation, including municipal, would be approximately 20 percent on Federal lands, 15 percent on state areas, and 65 percent on county and municipal lands. These differences point up the difficult problems of defining "recreation" adequately, particularly with reference to the scope of activities properly included in any analysis of use data.

Projected growth rates in visits to public lands exceed significantly the above noted trends in recreation participation. Comparative visitor data for 1960 and 1965 were noted by Manthy, indicating an overall growth rate of 56 percent. Forest Service visits had increased by 73 percent; Park Service visits by 68 percent; Bureau of Land Management visits by 59 percent, Corps of Engineers visits by 55 percent. These levels compare with the projected 60 percent increase in overall recreation participation between 1965 and 1980 and 141 percent by 2000 noted above from the Nathan study. Visits to Federal areas were projected as increasing by 465 percent between 1965 and 2000, compared to the BOR projected general trend of 160 percent. Such projections, if realistic, would suggest a much higher proportion of recreation visits occurring on Federal lands by 2000.

The economic variables relating to the demand for recreation, and similarly to the supply opportunities for the

public lands, are many. In perhaps no other area of public policy is the failure to distinguish between supply and demand factors more evident. The primary result of this failure has been the uncritical acceptance of consumption projections in many instances as policy prescriptions for supply objectives. Such projections are commonly viewed as "requirements to be met", a "public obligation" or "recreation needs". The implicit assumption is that public policy should be directed towards "meeting" the projected levels of "demand" through Federal action on public lands as well as through other programs to stimulate non-Federal provision of recreation.

Aggregate estimates of recreation participation or "demand" are not very meaningful as predictors of supply opportunities. Evaluations are needed of particular increments to the total recreation supply for a particular area or region at a particular point in time. Aggregate estimates fail to reveal the geographical nature of recreation demand, the interrelationship of demand with the use of other existing recreation opportunities (both similar and competing), and opportunity costs of using both lands and other scarce resources for recreational purposes. As with other goods and services, it is necessary to evaluate the feasibility of additional increments to the public recreation supply in terms of particular benefits and costs of each development. This cannot be done in the aggregate.

A primary obstacle to the orderly development of recreation opportunities has been the lack of information concerning the price-quantity relationship that is fundamental to demand analysis. The provision of public recreation at a zero or nominal cost has prevented the functioning of the allocative mechanisms of the price system. Excluding pricing from performing its normal role has both stimulated recreation use beyond levels that would otherwise prevail and distorted relative values at the margin, encouraging relatively more use of recreation opportunities. The provision or "supply" of recreation is not free, and treating it as such leads to substantial problems in resource allocation. The general taxpayer presently bears the greatest proportion of recreational costs - a payment only vaguely related to use.

A second limitation in evaluating supply opportunities is related to the fact that recreation is not entirely a consumer good. In most instances, the primary benefits from participation in recreation are of a private nature. Such direct benefits, however, are frequently accompanied by social benefits over and above accruals to the individual. Further, these social benefits may or may not be associated with particular levels of use.

A particular form of social benefit may be of increasing importance in recreation policy. There is increasing concern by many for the preservation and maintenance of wilderness, natural, and scenic areas, particularly those with unique ecological, physical or geological characteristics. In many instances, the use and development of such areas for nonrecreational purposes results in what may be an irreversible allocation of resources, at least in the sense of economically restoring the unique natural features. Many individuals would express a desire to see such areas maintained in a natural or seminatural state, even though they have no current or future plans to use or visit the site themselves.

In dealing with the economic aspects of recreation, this type of "demand" has become known as an "option" demand; that is, a demand may exist for the maintenance of recreation-type environments (as opposed to other types of use and development) unrelated to direct user demand. Because of the public nature of such option values, these decisions must necessarily be aggregative and made through nonmarket means. It should be obvious, however, that this aggregative decision is both conceptually and empirically different from those decisions governing the actual use of recreation areas once the area has been preserved.

The projections of recreation participation increasingly focus on the user-oriented types of areas as the primary type of recreation required in the future. With the increase in income and leisure time, the major recreational use will occur at sites more or less adjacent to population centers, which can be used for weekend, evening, and other short periods rather than for extended use. It has been stated by the Department of the Interior that about 75 percent of current outdoor recreation participation is of this user-oriented type.

Because of the geographical distribution of the public lands relative to population concentrations, it is highly unlikely that these lands can provide a significant proportion of the recreation opportunities of this type. Nevertheless, this demand will likely affect lands more distant from the population concentrations, including those public lands generally within the range of one-day outings. The probable trend will be for increasing pressures on the public lands to provide the unique opportunities to visit and see the ecological and geological features and to provide for "back country" forms of recreation, including fishing, camping, hiking, and hunting. In addition, the physical nature of the public lands makes them important as locations for winter sports facilities in many instances.

The magnitude of the projected levels of recreation use contained in the Nathan study clearly point out the problems of making projections based on extrapolations of historic trends. While parameters associated with recreation demand--including income, leisure time, population and mobility--were obviously considered, these assumptions are accompanied by the implicit assumption that the required "supply" of recreation opportunities will be economically forthcoming. There is little assurance that this is, or should be, the case. The provision of recreation, like any other good or service, requires the investment and expenditure of scarce resources. The economic supply of recreation will almost certainly be less than that "demanded" at zero or nominal prices. Only if demand is completely unresponsive to price will such a situation exist.

A final policy consideration relates to the feasibility of using public lands as the instrument of public policy for implementing any national goals for outdoor recreation. The Outdoor Recreation Resources Review Commission recognized the diverse nature of outdoor recreation and the primary urban or metropolitan orientation of recreation demand, and it urged a primary responsibility of local governments and organizations, including the private sector, in meeting supply opportunities. At the Federal level, the public lands are ill-suited to provide for a substantial proportion of the anticipated increase in recreation participation. Rather, the geographical location of these lands with respect to population concentration assures that these lands will find increasing use as extensive-use areas oriented towards unique features rather than as user-oriented areas. Obviously, these lands will also furnish user-oriented opportunities to local populations in many instances, because of their dominance in many local areas.

Timber Resources

The public lands have been, and will continue to be, an important source of timber in the national economy. This role is assured by the present distribution of land ownership of commercial forest land and timber volumes as well as the potential productive capacity of these lands for growing future timber supplies.

Projections of the consumption of major wood products have been prepared in the Nathan report and have been related to historical trends by Manthy. In general, these trends and projections are related to the consumption of converted wood products (or roundwood equivalents) rather than to the use of timbered acreage. Nevertheless, the assumed relationships between timber yields and acreage give some indication of the possible magnitudes of timber lands necessary to supply projected consumption levels.

As noted by Manthy, the overall trend in roundwood consumption has been quite stable in recent years, and has changed little since the early years of this century. This aggregate stability, however, has hidden important changes occurring among and between various categories of wood products.

Total use of roundwood timber production has remained relatively constant at approximately 10.5 to 11 billion cubic feet of timber annually since 1947, although this aggregate volu has increased somewhat since 1964. Aggregate consumption during this period, however, has been between 11.5 and 12 billion cubic feet, an apparent upward shift of about 0.5 billion cubic feet over prior levels. Uses of industrial roundwood have increased slightly but steadily, from some 8.1 billion cubic feet in 1947 to about 10.5 billion cubic feet in 1968. Log exports have also increased, from just about 0.1 billion cubic feet as recently as 1963 to over 0.4 billion cubic feet in 1968. The major offsetting trend has been in the use of wood for fuel purposes, where total volume has declined from about 2.7 billion cubic feet in 1947 to about 1.0 billion cubic feet in 1968.

Past trends in the use of industrial roundwood reveal that the use of sawlogs has remained nearly steady over the past two decades, reflecting the declining relative role of lumber. Sawlog production totaled about 5.5 billion cubic feet in 1947 and some 5.7 billion cubic feet in 1968. This volume represents an annual output of from 35.5 billion board feet to 36.5 billion board feet of sawnlumber and has been approximately 80 percent softwood over recent years.

While use of sawlogs has remained relatively constant, the use of industrial roundwood for veneer and pulpwood production has increased. The total production of veneer logs increased from just under 0.3 billion cubic feet in 1947 to over 1.1 billion cubic feet in 1968. Similarly, pulpwood production increased from about 0.9 billion cubic feet to over 3.2 billion cubic feet in 1968. In addition, the use of roundwood wastes in the form of residues and chips in pulp production has increased rapidly, from some 1.3 million cords in 1947 to over 16.3 million cords in 1968. In terms of roundwood equivalents measured in cords, total pulpwood production has increased from about 18.5 million cords in 1947 to over 57.3 million cords in 1968. Some 75 percent of this 1968 volume was softwoods, having declined from over 86 percent in 1947.

Minor miscellaneous industrial uses of roundwood, including cooperage, bolts, poles and pilings, shingles, ties, and similar products, have shown an aggregate decline in terms of total wood volume. In 1968, total volume for these uses was approximately 0.5 billion cubic feet, compared with a volume of some 0.9 billion cubic feet in 1947.

The United States has been a net importer of wood products in recent years. Thus, domestic consumption somewhat exceeds the above levels of production. As with production, however, overall consumption has remained relatively stable, ranging from 11.5 to 13.0 billion cubic feet annually. The major effect of net imports has been to increase the trend of sawwood products slightly in spite of the level trend in domestic production. For other domestic roundwood products, the consumption trends closely approximate those for domestic production.

Projections of both domestic consumption and production have been made by Nathan and Manthy for the PLLRC. To a large extent, these projections reflect modifications in projections made by the Forest Service of the Department of Agriculture. These modifications have been made on the basis of assumed differences in underlying economic aggregates.

Domestic consumption is projected to increase some 45 percent by 1980 (to 18.9 billion cubic feet) and 82 percent by 2000 (23.8 billion cubic feet). The relative importance of softwood is expected to remain at about 73 to 75 percent of consumption. After adjustments for expected trends in net imports, total domestic production of timber products is projected as 17.1 billion cubic feet in 1980 (up 45 percent) and 21.0 billion cubic feet in 2000 (up 78 percent). Softwoods are projected as about 68 percent of domestic production in 2000.

The future role of the public lands as a source of timber supply is dependent upon many factors, the primary ones being the relative ownership of timberlands and timber inventories, the trends in product categories relative to present inventories, potential productivity, and availability of timberlands for commercial timber use.

As was noted above with respect to recreation, there is often a general tendency to assume that projected consumption levels represent desirable production goals of the economy or more specifically, the public sector. This tendency has often dominated the consideration of the supply role of the public lands. The public lands are often viewed as the residual supplier - that is, the potential source of the net residual between total projected consumption and the economic supply assumed forthcoming from non-Federal sources. The policy questions are often cast in the shadow of such residual volumes.

As indicated by several sources, the Federal timberlands constitute approximately 22 percent of the national commercial forest lands, including about 2 percent of commercial forests in the Northeast, 12 percent in the North Central region, 7 percent in the South, and some 65 percent in the West. All public timberlands, including State and local government lands, total some 28 percent of all commercial forest lands but contain over 42 percent of timber volume. Nationally, some 56 percent of sawtimber volume is publicly owned, with over two-thirds of the softwood sawtimber volume in public ownership. Over 75 percent of the sawtimber volume in the West is in public ownership.

Although the production of timber products has remained relatively constant over the last two decades, the production from public lands has increased significantly, from about 0.9 billion cubic feet in 1947 to over 2.7 billion cubic feet in 1968. In relation to national production, the proportion from

public lands increased from about 8 percent in 1947 to over 23 percent in 1968. Federal timber production in 1966 is estimates as 63 percent sawlogs, 25 percent pulpwood, and 12 percent veneer logs.

As noted by both the Nathan and Manthy reports, the projections of consumption and production are predicated on assumptions concerning trends in relative prices, substitution of competitive products, and technology. The consumption projections implicitly assume that sufficient supplies will be forthcoming under these conditions.

Projected levels of consumption and production by product category have important implications for public timber supply policy. As noted by Manthy, the projection of sawlog products is expected to increase only 5 percent by 1980 and 14 percent by 2000. This increase is substantially less than the overall increase for all products. The dominant role of pulpwood products and other converted forms of wood in the future will certainly lead to the use of small timber sizes and a wider variety of species. As projected, pulpwood will account for over 55 percent of all timber production by 2000.

The present inventory of timber on the public lands is primarily of sawtimber. The expected shifts in product requirements, therefore, will have important implications as to the economic demand for particular sizes and species of sawtimber.

Under the assumed conditions noted above, and using the residual approach of subtracting projected private and industrial timber production from total projected consumption, the Manthy study concludes that "the residual left for the public lands to supply would be 7 billion cubic feet." After adjusting for non-Federal public production, "... the Federal lands are left with a supply target of at least 5.5 billion cubic feet". This is double the 1968 Federal production.

Aside from assumed supply targets, several critical economic considerations will influence the probable achievement of such a public output level. These factors relate to alternative uses of forested lands, the economic feasibility of investments in increased timber production, and the impact of changing product requirements. Timber lands no longer have value simply for the production of commercial timber volumes, if indeed this was ever so. Alternative values of timberlands for wilderness and recreation, wildlife habitat, watershed purposes, and minerals, among others, will increasingly mean that timberland production must be determined by relative rather than absolute values. The relative value of incremental volumes of timber must be weighed against the opportunity costs incurred by commercial timber activities on particular sites or lands. Also of importance is the fact that changing product requirements in terms of timber size, quality, and species characteristics will probably result in a relative (but not necessarily absolute) decline in the value of traditional products yielded from commercial timberlands on the public lands. This will be especially true for many forms of sawtimber.

A second important implication for public supply opportunities relates to the locational disadvantage of many timbered acres of public lands. These lands are generally at higher elevation, with adverse geographical features for commercial logging and, to some extent, are presently inaccessible by surface vehicles. The combined effect of these factors is to increase the relative costs of utilization. Additional investments of public resources will be required if these resources are to be made available for commercial use. Further, if yields are to be increased from other presently managed timberlands, substantial investments must be made. The economic feasibility of such investments has not been established in most cases, particularly when related to assumed "supply targets".

A secondary policy implication which cannot be ignored in evaluating the supply opportunities for public timber production relates to the existence of productive capacity in the wood processing industries. In some instances, there is an excess installed capacity, which for the purposes of present production decisions, represents fixed or sunk costs. The existence of this capacity will assure that there will be continuing demands for timber production in many regions of the West. This installed capacity, together with the regional concentration of Federal timberlands, will assure strong political pressures to maintain, or increase, rates of public timber harvest. As noted above, however, the future use of public lands for timber production will increasingly be adjudged on the basis of relative values rather than absolute values for commercial timber. While timberlands may be

onomically used for timber production, they will increasingly
looked upon as also being economically desirable for competing
tivities. These situations cannot be resolved by reliance
aggregate estimates of timber needs; rather, the incremental
lue of additional units of timber must be weighed against
mparable incremental units of other potential outputs. The
tablishment of "supply targets" on a national level provide
ttle constructive insight into resolution of these incre-
ntal output decisions. The changes in projected consumption
vels may well indicate the potential direction and magnitude
change in the use of wood products, and therefore possible
ifts in demand. Such shifts would also imply changes in
lative values and, therefore, negate in part the original
ojection based on assumed continuation of past trends in
lative values. In addition, shifts in relative values will
ve important implications for supply decisions. Where timber
lues are increasing relative to other goods and services, in-
eased outputs can often be economically justified. If rela-
ve values are declining, however, additional investments for
creasing outputs must be evaluated very carefully before being
cepted as economically desirable, irregardless of the physical
tputs envisioned.

ter Resources

Water yields from the public lands have historically been
portant for extensive areas of the West. Water yields may
utilized for what may be called natural uses, including
ch diverse "use" as evaporation, use by native vegetation,
sh and wildlife, and natural runoff into streams and rivers.
second category of use may be contrasted with the above, in
ny instances by the "artificial" nature of use. These would
clude water used for power generation, industrial purposes,
vestock, irrigation, recreation and domestic consumption.

The utilization of water resources may be either con-
mptive or nonconsumptive, and may take place in or adjacent
natural water sources. Alternatively, water may be trans-
rted considerable distances for ultimate use. Finally,
ter may be "consumed" and ultimately returned to the same
ter course or "consumed" and ultimately reintroduced into
e water cycle at a point independent of the initial source.
ter consumption is normally measured by water withdrawals.
thdrawals, however, may not be entirely of a consumptive
ture. Water may be returned to a stream system following

"use" in essentially the same volume (although not necessarily the same quality) that was withdrawn. Finally, non-consumptive uses, such as power generation and recreation, may require impoundments which ultimately affect the quantity and timing of water available for consumptive use.

Water withdrawal requirements in the western water region of the United States have been projected for the PLLRC by Nathan. Further, Manthy has combined the Nathan projections with those compiled by the Water Resources Council, although this latter source is considered by Manthy as being more reliable than the Nathan projections.

Water yields have averaged approximately 363 million acre feet in the Western States annually. Nine water resource regions produce this water yield, some 65 percent of which originates in the Columbia-North Pacific region. Water withdrawals in 1965 totaled almost 114 million acre feet, or about 32 percent of total yields. The dominant use of withdrawn water has been for irrigation, which accounted for some 83 percent of withdrawals in the West in 1965. Domestic use accounted for approximately 6.5 percent, power about 6 percent, and industrial uses another 4 percent. Livestock withdrawals accounted for less than 0.5 percent of all withdrawals.

Within the West, the projected water withdrawals show an increase of about 30 percent by 1980 and of about 140 percent by 2000. Consumptive uses are projected as increasing by about 32 percent by 1980 and by 62 percent by 2000. The relative importance of irrigation is projected as declining to 64 percent of withdrawals by 2000, with an increase in importance for both power and industrial uses. Municipal use will likely increase only moderately. Local supply difficulties will undoubtedly remain, as will problems of adequate time and geographic distribution of available supplies, particularly with respect to in-stream uses such as fish and wildlife, recreation, and maintenance of water quality.

Assuming past levels of water yield, projected withdrawals will be considerably less than yields in both 1980 and 2000. Consumptive use is projected as exceeding yield in only the Lower Colorado region by 1980, and only the Lower Colorado and Rio Grande by 2000. These regional deficits in water yields compared with consumptive use are expected to be adequately met through regional transfers under the provisions of existing compacts.

The public lands of the West yield a much higher percentage of total water yields than would be evident from acreage information. This results in the fact that public lands are estimated as the source of over 61 percent of water yields while

onstituting some 46 percent of the land area. The bulk of he water yields derive from lands managed by the Forest ervice, the National Park Service, and the Bureau of Land anagement. Lands of the Forest Service and Park Service ontributed some 97 percent of all water yields from public ands, and this amounted to over 54 percent of all western aters. Average yields per acre were reported to the PLLRC s 1.72 acre-feet per acre per year for lands under the ational Park Service, 1.45 for Forest Service lands, and bout 0.04 for Bureau of Land Management and other public ands.

In order to provide for current water yields from public ands, a reported total of 24 million acres of western public ands has been reserved or withdrawn for water and power proects, watershed protection, or other water-related uses. hese lands may be closed to other uses, or used only under imited and controlled conditions.

The economic demand on the public lands for future water ields will quite likely follow the projected trends, alhough actual quantitative levels of use will be variable. his trend reflects the fact that the use and allocation of water reources is largely governed by legal and political instituions rather than by economic values. In almost no instance is ater treated as an economic commodity. Further, economic riteria are seldom controlling in the decisions as to mainaining, developing or protecting water yields. Investments re often undertaken to increase (or maintain) levels of water ields without a basic identification of the relative values nvolved. Given the existing political and legal institutions overning the allocation of water resources, it is perhaps isleading to use the economic concept of demand with respect o water policy. Supply decisions, however, must be made and hese will be influenced by several important determinants. hese are noted briefly below.

The existing distribution of population, and projected opulation growth, will result in heavy pressures to provide dequate supplies of water with respect to both quantity and uality regardless of locational disadvantages. Existing ocial structures are unlikely to accept insufficiencies in ater supply as limiting their development. By and large, upplies will be sought to support domestic and industrial uses of water in spite of the *ex ante* realization that alternative locations or patterns of development might have been more economical.

The rapidly increasing opportunity costs of providing adequate water yields, and the transport costs of reallocating water supplies between major drainage basins, will certainly provide additional incentives for development of alternative sources of water. These will include the potential conversion of salt waters by thermal or chemical means and the recycling or reuse of currently withdrawn waters. The single use of withdrawn waters is increasingly recognized as largely inefficient. Further, considerations of water quality will become more important as the qualitative rather than quantative aspects of water yields become critical.

The noncommercial or nonconsumptive uses of water will also grow in importance - a factor not readily expressed in projected water withdrawals or levels of consumptive use. Uses associated with waterfowl protection, flood control, recreation, maintenance of stream flow, and similar uses will likely increase as the qualitative aspects of human activity grow in importance. Water sports, for example, are among the fastest growing outdoor recreation activities. Finally, the protection of domestic watersheds may well lead to restricting nonconforming uses or perhaps withdrawal of watershed acreage in support of these domestic supplies. Additional pressures on the resource base adjacent to major population concentrations in the West will undoubtedly lead to increasing conflicts between maintenance and development of water yields and other forms of resource use. The relative location of the public lands, and their dominant influence in western water yield, will assure that these pressures will be felt in connection with public land policy. Although relative resource values will normally be expected to provide guidance to the resolution of these conflicts, it is apparent that they will not be controlling. There is little to indicate that water institutions are apt to be more responsive to economic forces in the future.

Mineral Resources

The public lands of the United States have historically served as the dominant source of mineral production as measured by aggregate mineral production. The role of the public lands has been examined for the PLLRC by several individual studies, and projections of future levels of mineral consumption compiled in the Nathan report. The potential implications for both energy fuel minerals and selected nonfuel minerals have been drawn by Manthy. As with other commodities, these considerations have important economic implications for public supply decisions.

The growth of energy consumption in the national economy has been at an average rate of 3 percent per year since 1947. Fossil fuels have been the major source of energy, having accounted for some 99.1 percent of energy supply in 1947 and 98.7 percent in 1965. The relative importance of hydroelectric power has not changed significantly during this period. Nuclear sources accounted for approximately 0.1 percent in 1965.

Among the fossil fuels, there has been substantial change in spite of the overall stability. In 1947, some 50 percent of the energy from fossil fuels was provided by coal, 36 percent from petroleum, and about 14 percent from natural gas. By 1965, these relative shares of fossil fuel energy were 23 percent for coal, 46 percent for petroleum, and 31 percent for natural gas. At the same time that these changes were taking place for fossil fuels, the use of nuclear power increased rapidly, at an annual rate of 47 percent between 1960 and 1965.

The relative trends in consumption of energy derived from fossil fuels is reflected in domestic production. Production of crude petroleum increased from about 1.9 billion barrels in 1947 to over 3.2 billion barrels in 1967. Production of natural gas increased from 4.6 trillion cubic feet to about 18.2 trillion cubic feet in 1967. The production of natural gas liquids also increased, from about 5.6 billion gallons in 1947 to over 21.6 billion gallons in 1967.

In contrast to these trends, the production of bituminous coal and lignite declined from 627 million short tons in 1947 to 553 short tons in 1967. Production of anthracite coal also declined, from 57 million short tons to 12.3 million tons.

Numerous estimates of future energy requirements have been made available to the PLLRC and have been summarized by Manthy. In general, each projection rests on differing assumptions concerning underlying economic variables and, for this reason, are not directly comparable. Nevertheless, the relative magnitudes of probable growth are indicative of possible future consumption. Projections for 1980 generally indicate a doubling of possible consumption over 1965 levels, from about 54 quadrillion BTU's to over 90 quadrillion BTU's. The Nathan projection is for some 91 quadrillion BTU's in 1980. The general consensus is that petroleum products will account for between 35 and 40 percent of this total and gas another 30 percent. Individual projections, of course, differ somewhat, but generally reflect this range. Projections in the Nathan study for 2000 show energy consumption at approximately 155 quadrillion BTU's, of which oil is expected to provide some 34 percent and gas about 28 percent. The largest change is expected to be for nuclear fuels, which were less than 0.1 percent in 1965 but projected at about 16 percent of all energy consumption by 2000.

Overall, projected levels of energy production by source for the year 1980 are: coal, 22 percent; oil, 34 percent; gas, 31 percent; hydroelectricity, percent; and nuclear power, 10 percent. By 2000, these shares are expected to be 19, 34, 28, 2 and 16 percent respectively. These consumption levels indicate that the output of energy fuels will increase for all energy sources, but at differing rates. The projections for coal indicate a growth of 47 percent by 1980 and just over 100 percent by 2000. Oil requirements, on the other hand, are projected as increasing 40 percent by 1980 and 142 percent by 2000. Gas, in comparison, is projected as increasing by 65 percent in 1980 and 158 percent in 2000. Other projections show hydroelectric power increasing by only 70 percent by 2000. Nuclear fuels will increase significantly, although consumption levels for 1965 are not reported by Manthy. Requirements are projected at 40 thousand tons in 1980 and 75 thousand tons in 2000.

The role of the public lands as a source of energy fuels has increased rapidly. Petroleum production on leased lands,

including the Outer Continental Shelf, has increased from 4.9 percent of total production in 1947 to over 14.6 percent in 1967. Gas production has increased from 2.5 percent to over 13.2 percent of total gas output. Production of natural gas liquids has remained at about 3.5 to 4.0 percent of the United States total. Coal from the public lands has also remained relatively constant at approximately 1.5 to 2.0 percent of national output. Although uranium was not reported by Manthy, the AEC has advised that in mid 1969, approximately 60 percent of the domestic uranium reserves were on the public domain and that about 67 percent of the uranium production during the period 1948-1966 was from the public domain.

The probable future role of the public lands in providing for the production of energy fuels will be governed by several important factors, including the presence of known reserves, the probabilities of future discoveries on public and private lands, the relative costs of production on public and private lands, and the terms and conditions under which public lands are made available for mineral production. Further, elements of national policy relating to import quotas, tariffs, and prorationing will ultimately have impacts, although of unknown degree.

In the aggregate, /known mineral inventories appear sufficient to meet the projected levels of consumption, if costs of production and possible implications of reducing known inventories are ignored. Estimates of known reserves, proven reserves, and economically recoverable reserves are highly variable. Of perhaps more importance is the likelihood of new discoveries on public and private lands. Several factors indicate that the public lands will likely serve as an increasingly important location for new discoveries - and subsequently, energy mineral production. The role of energy minerals in Alaska and the Outer Continental Shelf is only currently being understood. These two sources alone point out the probable relationship between future mineral production and the public lands. Further, the joint influence of land availability, prior degree of exploration, and known geological structure all indicate the probability that the public lands will be increasingly important as a source of new mineral discoveries. As private lands are intensively developed, the prospects for mineral exploration and production are reduced. Further, the public lands have, as a general proposition, not been explored as extensively as most private lands. In addition, the known geology, and those characteristics favoring the occurrence of fuel energy sources, point to the public lands as probable sources. These geological features, together with the distribution of public lands, make them much more likely future sources of energy fuels.

Elements of public policy, including the terms and conditions under which public lands are made available as well as other national policies, will govern the extent to which mineral resources can be economically developed. The actual production will be governed by competitive markets for various energy fuels, the development of production technology, and the relative costs of production. The terms and conditions of land availability under the mining laws and mineral leasing laws will have important impacts on production costs. In contrast, policies governing mineral imports, tariffs, and quotas will influence energy markets. To a large degree, energy fuels can substitute in end uses, and the relative growth of each source will depend in part on the trends in each other source.

The probable supply implications for nonfuel minerals in relation to public lands are much less clear than for energy fuels. To a large extent, the actual production of these minerals is beyond the immediate control of the Federal Government. Under existing law, these minerals are subject to private development in most instances, where the initiative for both discovery and development are beyond immediate Federal regulation. Under the 1872 Mining Law, lands can ultimately be patented into private ownership, in which case the production of minerals becomes entirely private. In addition, production can occur on mining claims without patent, in which case there is no direct control or accounting of production. For this reason, the role of the public lands is extremely difficult to evaluate. Even where production occurs on patented lands or unpatented claims, there may be a question as to whether this technically constitutes a public land output. Nevertheless, from a practical standpoint, the lands or production are extremely important in terms of total mineral production. For many purposes, it makes little difference whether the production is considered as coming from public or private lands. From a public land policy standpoint, however, it is important to distinguish whether production is subject to Federal regulation. Under the Mining Law as it presently exists, the role of policy is largely restricted to making lands available to mineral interests for exploration, development, and production and to a lesser extent, regulating conditions of use. In contrast, the policies relating to mineral leasing are much more directly related to mineral production.

Historical trends indicate an increase in the production and consumption of most mineral products. Production of phosphate rock increased by some 200 percent between 1948 and 1965. Potash consumption also increased rapidly, from 1.1 million tons in 1948 to over 3.4 million tons in 1965. Likewise, domestic production of sulfur increased during this period by almost 50 percent. United States consumption of iron ore, aluminum, copper, lead, zinc, magnesium, and other metals and minerals have also increased during the past two decades. In all cases, increased consumption is projected by both 1980 and 2000. Total consumption of nonfuel minerals has been projected by Nathan as increasing in the aggregate by some 77 percent by 1980 and perhaps by as much as 236 percent by 2000.

The economic factors noted above relative to the potential role of the public lands for energy fuels apply equally to the nonfuel category. The availability of lands for future exploration and possible discovery, the terms and conditions under which the lands are made available, and the relative costs of development will largely govern mineral activities relating to nonfuel minerals. As has been indicated elsewhere in the studies of the mineral production from public lands, the present policies under the Mining Law provide a nonspecific incentive for mineral development. It is often assumed to be in the national interest to encourage the exploration and development of minerals. The present policies, however, do not differentiate among those minerals of significant national importance, the relative scarcity of these minerals, or the availability of alternative sources of supply. The public policies stimulate mineral activity on the public lands in contrast to possible development on private lands.

Although economic demand for mineral products ultimately determines the derived demand for minerals on the public lands, the role of public policy in allocation and development is pervasive. The dual influences of mineral policy as related to land availability and terms and conditions of disposal will, in all likelihood, have the dominant influence on the functioning of future mineral demands associated with public lands. Although economic considerations will largely govern the actual extent of development, these policy factors will clearly be more dominant in defining the future scope of mineral activity. As with other commodities, the influence of competitive uses, and the relative values associated with them, will tend to increase the relative costs of mineral activities. In some instances, environmental considerations may well preclude (or severely restrict) mineral activities. In most cases, however, the influence will be more indirect, leading to modifications of existing practices and technology and, therefore, influencing relative costs. Such influence, moreover, will not be restricted to operations on the public lands, but will likely affect most types of mineral production. Should such restrictions be specific to public lands, however, a differential effect would obviously discourage mineral activity on these lands in favor of other potential sources of production.

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History of Public Land Law Development. Written by Professors Paul Wallace Gates of Cornell University and Robert W. Swenson of the University of Utah. 1968. $8.25

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Study of Withdrawals and Reservations of Public Domain Lands. Prepared by Charles F. Wheatley, Jr. Revised September, 1969. Order numbers: P B 187 002, P B 187 003, P B 187 004.

Administrative Procedures and the Public Lands. Prepared by The University of Virginia, School of Law. Revised September, 1969. One volume. Order number: P B 187 205.

Fish and Wildlife Resources on the Public Lands. Prepared by the Department of Fishery and Wildlife Biology, Colorado State University. Revised September, 1969. Two volumes. Order number: P B 187 246, P B 187 247.

Public Land Timber Policy. By George Banshaf & Company, Milwaukee, Wisconsin. Published in four volumes, Nos. PB 187 728, PB 187 729, PB 187 730, PB 187 731.

Federal Public Land Laws and Policies Relating to Intensive Agriculture. Resources portion by South Dakota State University. Legal portion by Kronick, Moskovitz, Tiedemann & Girard, Sacramento, California. Published in four volumes. Legal portion, Volume I, No. PB 188 061; resources portion, Volumes II, III, and IV, Nos. PB 188 062, PB 188 063, PB 188 064.

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